

ZOOLOGY.—*Anguillulina askenasyi* (Bütschli, 1873), a gall forming nematode parasite of the common fern moss, *Thuidium delicatulum* (L.) Hedw.¹ G. STEINER, Bureau of Plant Industry.

There are quite a few records of the occurrence of nematode galls on mosses from Europe, but, as far as known to the writer, there are no such records from this country. All previous observations were

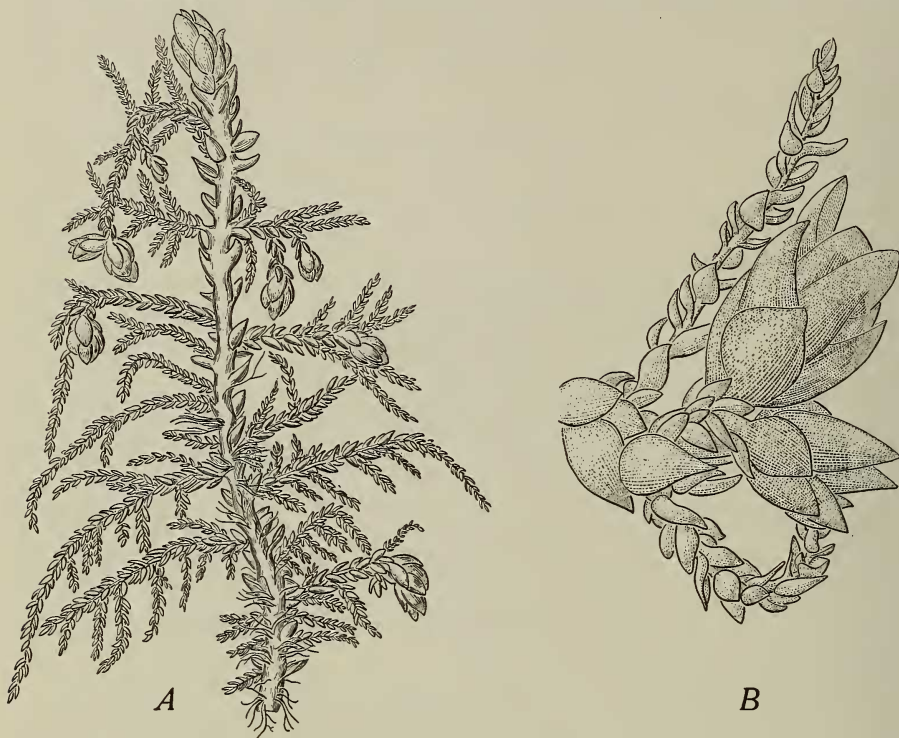


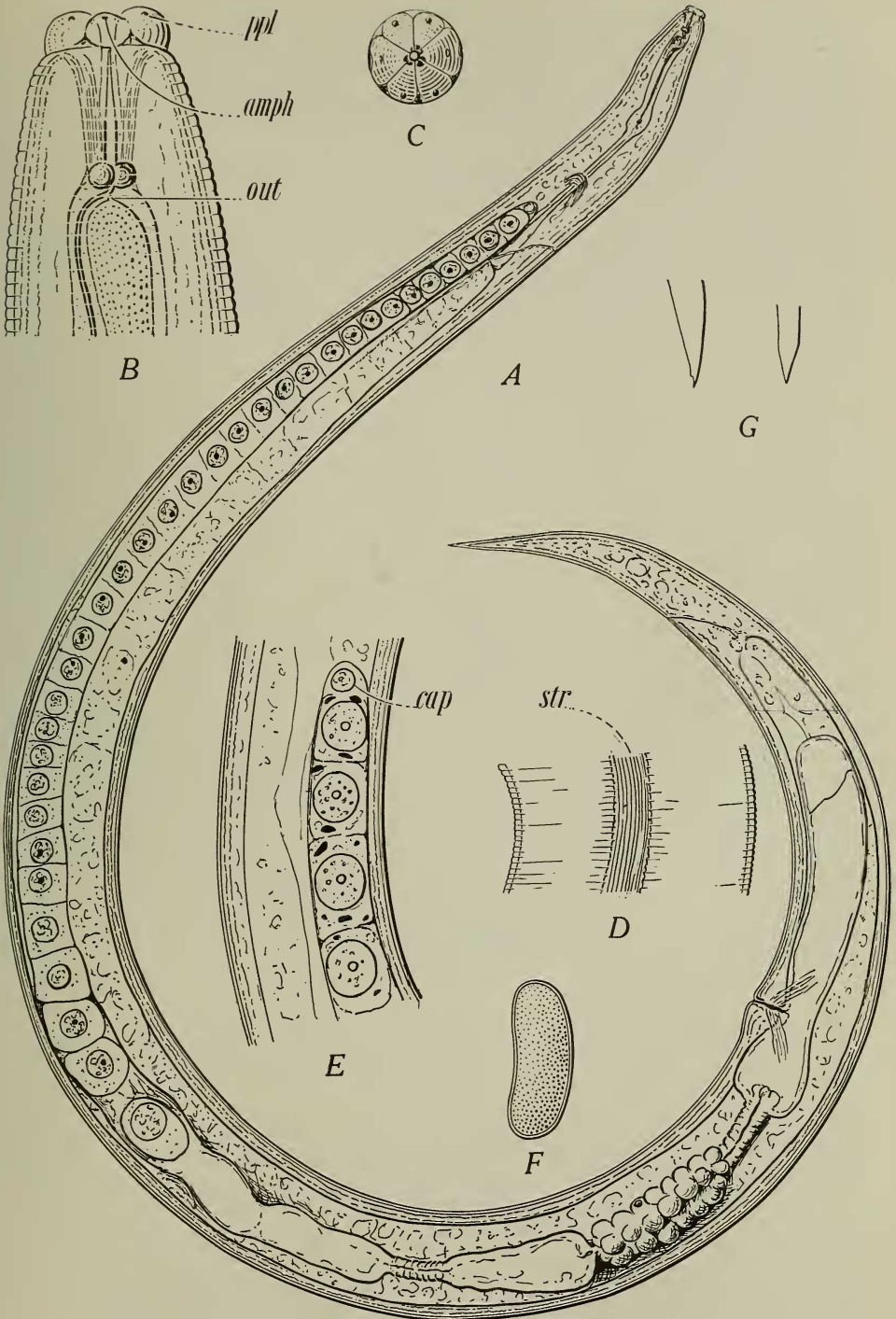
Fig. 1.—*Thuidium delicatulum* (L.) Hedw. with galls caused by the nematode *Anguillulina askenasyi* (Bütschli). A, stem and branches with terminal galls. $\times 6$. B, detail of two galls. $\times 24$.

summarized in 1906 by Schiffner and further additions reported later by Horn (1909).

Through Mr. J. L. Sheldon of Morgantown, West Virginia, a sample of *Thuidium delicatulum* with galls was received with the inquiry as to the name of the nematode species present. The moss had been collected in a wood across the road from the old Iron Furnace, near

¹ Received June 5, 1936.

Fig. 2.—*Anguillulina askenasyi* (Bütschli). A, female. $\times 370$. B, head end of female; *amph*, amphid; *ppl*, cephalic papilla; *out*, outlet of dorsal esophageal gland. $\times 1900$. C, front view of head of male. $\times 1900$. D, striated lateral field in adult; *str*, striae. $\times 1900$. E, proximal end of ovary; *cap*, cap cell. $\times 730$. F, egg. $\times 250$. G, variations in terminus of tail. $\times 330$.



For explanation of Fig. 2 see bottom of opposite page.

Albright, Preston County, West Virginia, on September 21, 1935. *Thuidium delicatulum* is a member of the family *Thuidiaceae* (*Musci*) and is a species occurring in moist woods in Europe, Asia and on this continent from Labrador to the Rocky Mountains, south to the West Indies and South America.

The galls, measuring .680–.716 mm by .868–.877 mm, are terminal galls, found on the stem as well as on the branches. They closely resemble those described by Massalongo (1898) as caused by *Tylenchus* (*Anguillulina*) in *Zieria julacea* Schimp., and are of the artichoke type (see Fig. 1), having no side shoots or any resemblance to the witches broom type of galls as described from some other mosses, e.g. *Dicranum*. The leaves on the galls are enlarged to a size greater than the branch leaves or even the stem leaves. Their color is the same green as that of the plant. They are densely set on the oval gall, the outline of which may be recognized through them. From all appearances it is concluded that the galls render the branches and stems blind; they probably drop in a later stage. Each gall usually contains a small number of adults (7 to 12) with some 200–300 larvae and eggs. Although the moss had been dried for 8 months, the larvae and adults revived after a short period of soaking.

Description of the nematode (Figs. 2–3). The present parasite markedly resembles *Anguillulina dipsaci* (Kühn, 1858) Gerv. & v. Ben., 1859, with which it was formerly synonymized in spite of the clear-cut statement by Bütschli that it is different (J. Ritzema Bos and al.). The body, however, is much stouter than in the true *A. dipsaci*, although the present specimens were not quite as stout as those described by Bütschli under the name *A. askenasyi* (Bütschli, 1873) from the moss, *Hypnum cupressiforme* Hooker. Cuticle with rather fine annulations, 1μ wide; tail pointed, sharply in adults, much less in the larvae. Lateral fields about $1/5$ of body diameter in width; larvae with two edging striae and a middle longitudinal stria; adult with about 10 much finer longitudinal striae; annulation interrupted on lateral fields. Head sharply set off, somewhat rounded, with rather plain submedial papillae. Framework light. Buccal stylet short, finer and smaller than in *A. dipsaci*. Terminal esophageal bulb distinctly set off from intestine, with esophageal glands still within the bulb. Intestine with large cells, seemingly in double alternate series. Rectum and anus very fine, often even obscure, especially in the adult. Excretory pore in adults ventrad of terminal esophageal bulb; in larvae ventrad just back of nerve-ring. Female apparatus with postvulvar sac-shaped uterus usually extending more than half the distance vulva-anus. Ovary most often straight, rarely reflexed, with terminal cap cell (Fig. 2, E). Outlets of ovary well differentiated, with oviduct leading into receptaculum seminis; latter differentiated from uterus proper by distinct narrow duct. Eggs deposited unsegmented. Male testis straight, not reflexed. Spicula much like those of *A. dipsaci*, with lineate gubernaculum of about $1/3$ spicula length. Bursa rises suddenly a short distance behind, or level with, proximal spicula end, in most specimens reaching only about halfway down the tail, rarely a little farther; in a male with a tail

of 103μ , it extended to a distance of 64μ back of the anus. *A. askenasyi* is considered a good species and is herewith reestablished. The original form was observed only once, namely by Bütschli, in Germany, on the moss, *Hypnum cupressiforme*, where, according to this author, it induces certain transformations in terminal buds, without, however, producing galls. It lives between the leaves of the buds of this moss. Although resembling *dipsaci*, it differs from it by being stouter, by having a longer esophagus, in

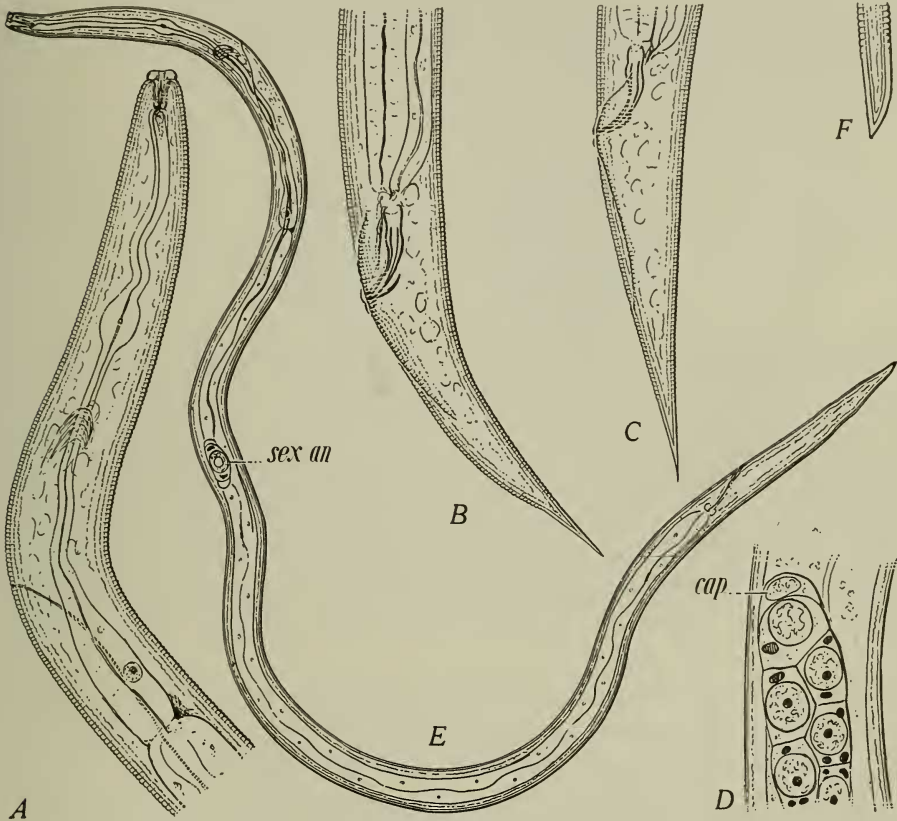


Fig. 3.—*Anguillulina askenasyi* (Bütschli). A, anterior end. $\times 420$. B and C, two different male tail ends; in C the bursa beginning farther back than in B. $\times 420$. D, proximal end of testis; cap, cap cells. $\times 640$. E, larva of .648 mm length; sex an, sexual anlage. $\times 330$. F, terminus of larval tail. $\times 640$.

both sexes a longer tail, an intestine of brownish color, and a shorter bursa in the male which reaches only about halfway, or slightly farther, down the tail. In addition the vulva has a more anterior position. Adults of the present species usually take a "more or less rolled-up" spiral position.

Gall forming nematodes in mosses in the past have been referred to *Anguillulina davainii* (Bastian, 1865); whether correctly or not cannot be stated at present, the published descriptions being rather incomplete.

Measurements of specimens from *Thuidium delicatulum*: ♀ (n 10) total length = .980–1.2 mm; $\alpha = 23\text{--}31$, $\beta = 8\text{--}11.5$, $\gamma = 8.5\text{--}12.8$, $\nu = 73\%\text{--}78\%$.

Distance vulva-anus = about twice length of tail; eggs $36-41\mu \times 80-100\mu$; stylet $8-10\mu$. ♂ (n 5) total length = .92-1.2 mm; $\alpha = 24-31$, $\beta = 8.1-10.7$, $\gamma = 8.5-14.5$; spicula about 30μ ; gubernaculum $8-10\mu$; stylet $8-10\mu$.

Measurements as given by Bütschli for the type form: ♀ = 1.7 mm; $\alpha = 19$, $\beta = 10$, $\gamma = 13$; $\nu = 80\%$; eggs = $50\mu \times 95\mu$; stylet = 13μ . ♂ = 1.4 mm; $\alpha = 20$, $\beta = 10$, $\gamma = 12$.

Emended diagnosis of A. askenasyi: Resembling *A. dipsaci* but stouter, vulva more cephalad, bursa shorter, reaching only half, or slightly more than halfway, down the tail; eggs much thicker, deposited unsegmented; intestine of brownish color; female usually assuming shape of a sickle or a more or less rolled-up spiral.

Type host: *Hypnum cupressiforme* Hooker.

Type locality: Feldberg, Taunus (Germany).

In view of the difference in symptoms as caused by Bütschli's type form (ectoparasite, not producing galls) and the present form (entoparasite, producing galls), it is thought best to consider the two as different host varieties, a conception also supported by slight differences in dimensions.

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ZOOLOGY.—*The histology of nemic esophagi. VII. The esophagus of Leidynema appendiculatum (Leidy, 1850.)*¹ B. G. CHITWOOD, Bureau of Animal Industry, and M. B. CHITWOOD.

This paper is the seventh of a series dealing with the histology of nemic esophagi. In the earlier papers (1934-1936) the esophagi of *Rhabdias eustreptos*, *Oesophagostomum dentatum*, *Heterakis gallinae*, *Metastrongylus elongatus*, *Rhabditis terricola* and *Rhabditis lambdiensis* have been described. The nomenclature used in this paper was explained in the first paper of the series.

GROSS MORPHOLOGY

The length of the esophagus of *Leidynema appendiculatum* usually ranges from 396 to 448μ in the gravid female, but in the gravid female upon which subsequent measurements are based, it is 364μ long. It consists of a cylindri-

¹ Received March 13, 1935.